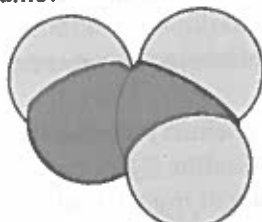


## Chapter 4 Review

### Developing Chemical Equations

#### Multiple Choice

For each question below, select the best answer.

- What term is used to describe a full outer energy level of electrons?
  - valence electron
  - ionic compound
  - anion
  - cation
  - stable octet
- Which of the following statements about naming binary molecular compounds is *true*?
  - The first part of the name identifies the negative ion.
  - The first part of the name contains the suffix *-ide*.
  - The second part of the name identifies the positive ion.
  - The second part of the name contains the suffix *-ite*.
  - The second part of the name contains a prefix indicating the number of atoms of that element in each molecule.
- Which of the following is the chemical formula for ammonium sulfite?
  - $(\text{NH}_4)_2\text{SO}_4$
  - $(\text{NH}_4)_2\text{S}$
  - $(\text{NH}_4)_2\text{SO}_3$
  - $\text{NH}_4(\text{SO}_3)_2$
  - $\text{NH}_4(\text{SO}_4)_2$
- The space-filling model below shows a molecule of a binary molecular compound. What prefixes should be used in the name?
  - di-* and *tri-*
  - di-* and *tetra-*
  - tri-* and *penta-*
  - di-* and *penta-*
  - tri-* and *tetra-*
- Which of the following is the chemical formula for carbon disulfide?
  - $\text{CS}_2\text{O}_3$
  - $\text{C}_2\text{S}$
  - $\text{C}(\text{SO}_3)_2$
  - $\text{CaS}_2$
  - $\text{CS}_2$
- How many atoms of each element are present in  $3\text{Al}_2(\text{CO}_3)_3$ ?
  - 6 Al, 3 C, and 9 O
  - 6 Al, 9 C, and 27 O
  - 2 Al, 3 C, and 9 O
  - 6 Al and 27 CO
  - 3 Al, 9 C, and 27 O
- Which of the following is *not* a balanced chemical equation?
  - $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\ell)$
  - $2\text{Na}(\text{s}) + \text{F}_2(\text{g}) \rightarrow 2\text{NaF}(\text{s})$
  - $2\text{Fe}(\text{s}) + 6\text{HCl}(\text{aq}) \rightarrow 3\text{H}_2(\text{g}) + 2\text{FeCl}_3(\text{aq})$
  - $2\text{HNO}_3(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\ell) + \text{Ba}(\text{NO}_3)_2(\text{aq})$
  - $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
- What is the correct balanced chemical equation for the reaction in which crystals of aluminum bromide form from the reaction of liquid bromine and aluminum metal?
  - $2\text{Al}(\text{s}) + 3\text{Br}_2(\ell) \rightarrow 2\text{AlBr}_3(\text{s})$
  - $\text{AlBr}_3(\text{s}) \rightarrow \text{Al}(\text{s}) + \text{Br}_2(\ell)$
  - $2\text{AlBr}_3(\text{s}) \rightarrow 2\text{Al}(\text{s}) + 3\text{Br}_2(\ell)$
  - $\text{Al}(\text{s}) + 3\text{Br}_2(\ell) \rightarrow 2\text{AlBr}_3(\text{s})$
  - $\text{Al}(\text{s}) + \text{Br}(\ell) \rightarrow \text{AlBr}(\text{s})$

## Chapter 4 Review

### Developing Chemical Equations

#### Written Answer

Answer the following questions in your notebook.

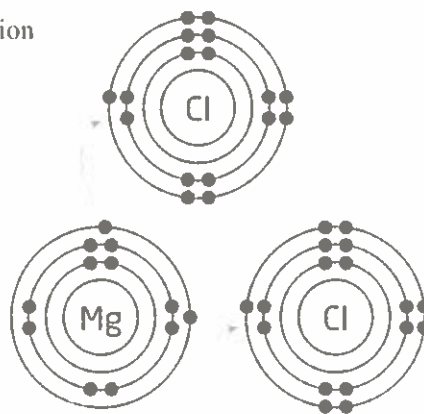
9. How is the naming of a binary ionic compound like the naming of a binary molecular compound?

10. The Bohr-Rutherford diagram on the right shows the formation of a compound.

a. Is the compound ionic or molecular?

Explain your reasoning.

b. What is the chemical formula and name of the compound shown?



11. Identify each compound as ionic or molecular and name each one.

a.  $\text{SCl}_2$

b.  $\text{K}_2\text{S}$

c.  $\text{MnSO}_3$

12. Identify each compound as ionic or molecular.  
Write the chemical formula for each compound.

a. copper(II) hydroxide

b. nitrogen tribromide

c. sodium carbonate

13. Why must you *not* change a subscript when balancing a chemical equation?

14. Balance each chemical equation.

a.  $\text{CuCl}_2(\text{aq}) + \text{K}_3\text{PO}_4(\text{aq}) \rightarrow \text{KCl}(\text{aq}) + \text{Cu}_3(\text{PO}_4)_2(\text{s})$

b.  $\text{Fe}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{Fe}_2\text{O}_3(\text{s})$

c.  $\text{Al}_2\text{O}_3(\text{s}) \rightarrow \text{Al}(\text{s}) + \text{O}_2(\text{g})$

15. When solid sodium carbonate is heated, it breaks down into carbon dioxide gas and leaves a residue of sodium oxide. Write a balanced chemical equation for this reaction. Include indications of state for all reactants and products.

16. Compare the number of atoms of each element in the reactants with the number of atoms of the same elements in the products. How does a chemical equation illustrate your answer?

## Chapter 4 Review

### Developing Chemical Equations

#### Written Answer

Answer the following questions in your notebook.

17. The image below shows Bohr-Rutherford diagrams placed in the framework of the periodic table for the first 18 elements. Using the diagram, how can you identify the number of valence electrons in an atom of an element using the group numbers? **T/I**

1							18
1 1 (H)							2 2 (He)
2 3 (Li)	2 4 (Be)	13 5 (B)	14 6 (C)	15 7 (N)	16 8 (O)	17 9 (F)	10 (Ne)
3 11 (Na)	12 (Mg)	13 13 (Al)	14 14 (Si)	15 15 (P)	16 16 (S)	17 17 (Cl)	18 18 (Ar)

18. A student writes the incorrect chemical formula  $\text{CuOH}_2$  for the compound copper(II) hydroxide. Analyze the formula, and explain why it is incorrect. Then write the correct formula for the compound. **T/I**
19. While cleaning outdated chemicals from a storeroom, a hazardous materials worker finds a container whose label is almost unreadable. All that the worker can read of the chemical's name is the suffix *-ate*. What can the worker infer about the likely contents of the container from this information? Explain your reasoning. **A**
20. Decide whether the following statement is true or false and explain your reasoning.  
"A ternary ionic compound must contain a polyatomic ion." **T/I**
21. Which groups in the periodic table contain only metals that are *not* followed by a Roman numeral in the name of an ionic compound? Explain your reasoning. **T/I**
22. Binary molecular compounds are a small fraction of all molecular compounds. More complex molecular compounds are named by a different set of rules. For example, the compound *octane* has 8 carbon atoms joined together in the molecule. Based on your knowledge of prefixes, how many carbon atoms make up a molecule of pentane? **T/I**
23. What non-metal does *not* satisfy the octet rule when it forms covalent bonds? Explain your reasoning. **T/I**
24. Why are prefixes used in the names of molecular compounds but not in the names of ionic compounds? **T/I**

## Chapter 4 Review

### Developing Chemical Equations

#### Written Answer

Answer the following questions in your notebook.

25. Write a set of instructions for identifying whether a given chemical formula represents a binary ionic compound or a binary covalent compound. **C**
26. A scientist placed copper powder into a crucible and heated it until all of the copper reacted. The resulting product was cooled and its mass was measured. The data collected during the experiment are shown in the table below. **T/I**

Experimental Data

Mass of Crucible (g)	Mass of Copper + Crucible (g)	Mass of Copper (g)	Mass of Copper(II) Oxide + Crucible (g)
35.0	50.2	15.2	54.0

- a. Using the law of conservation of mass, explain how the mass of this system increased.
- b. Write a balanced chemical equation for the reaction. You do not need to indicate states of reactants or products.
27. A closed system is one in which matter cannot enter or escape. Explain why a closed system is important when investigating the law of conservation of mass. **T/I**
28. Make a flowchart to show the steps involved in writing a balanced chemical equation when given a skeleton equation. **C**
29. Write a word equation, a skeleton equation, and a balanced chemical equation for each chemical reaction. Include indications of state for all reactants and products in the chemical equation. **T/I**
- a. When solid mercury(II) oxide is heated it breaks down into oxygen gas and liquid mercury.
- b. Hydrogen gas and an aqueous solution of magnesium chloride form when a piece of magnesium metal is placed into hydrochloric acid, HCl(aq).
30. Potassium nitrate has a wide range of applications that include use in fertilizers, in treating high blood pressure, and as a component of gunpowder. Potassium nitrate is prepared for commercial use by reacting potassium chloride with sodium nitrate. Sodium chloride is also produced. Write a balanced chemical equation for this reaction. You do not need to indicate states of the reactants or products. **A**
31. Each of the following chemical equations is balanced, but it is incorrect in some other way. State what is incorrect, and then write the equation correctly. **T/I**
- a.  $\text{LiNO}_3(\text{aq}) \rightarrow \text{LiNO}_2(\text{aq}) + \text{O}(\text{g})$
- b.  $\text{Cs}(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow \text{CsCl}_2(\text{s})$
32. What are four principles of green chemistry? Which principle involves the law of conservation of mass? Explain your answer. **A**